Chapter 1
Introduction

DRAFT
SUPPLEMENTAL
ENVIRONMENTAL
IMPACT STATEMENT

Brightwater
Regional Wastewater
Treatment System

Chapter 1
Introduction

This chapter briefly describes activities that have led to preparation of this Supplemental EIS, including an administrative appeal of the Brightwater Environmental Impact Statement and the Hearing Examiner's decision on the appeal. The chapter also describes revisions to the Brightwater proposal since the EIS was issued, incorporation of seismic information into Brightwater siting and design, uncertainties about seismic features and proposed buildings on the Route 9 site, and the likelihood of serious earthquake damage to Brightwater facilities.

1.1 Why Is King County Issuing a Supplement to the Brightwater Environmental Impact Statement?

King County issued a Final Environmental Impact Statement (EIS) on the proposed Brightwater Regional Wastewater Treatment System in November 2003. Since that time, new information about the Southern Whidbey Island Fault (SWIF) has become available. This Supplement to the Brightwater EIS describes the new information and its relationship to the Brightwater Treatment Plant site and evaluates the significant adverse environmental impacts that could result if an earthquake were to occur on the SWIF and damage treatment plant facilities.

1.1.1 Final Environmental Impact Statement

The King County Department of Natural Resources and Parks, Wastewater Treatment Division (WTD), issued an EIS for the Brightwater Regional Wastewater Treatment System on November 19, 2003. The EIS was prepared pursuant to the Washington State Environmental Policy Act (SEPA) (43.21C RCW and WAC 197-11). The EIS analyzed the environmental impacts of siting, constructing, and operating the Brightwater System. It also analyzed the impacts of a No Action Alternative.

The Brightwater System is made up of a treatment plant, associated wastewater and reclaimed water conveyance pipes, a pump station, and an outfall. In addition to the No Action Alternative, the EIS analyzed two treatment plant locations: the Route 9 site in unincorporated Snohomish County, north of Woodinville, and the Unocal site in Edmonds. Alternative corridors for pipelines and other facilities necessary to convey wastewater to and from each treatment plant site were analyzed along with alternative conveyance designs and construction methods. Two marine outfall zones also were considered (Figure 1-1).

The EIS identified the Route 9–195th Street System as the Preferred Alternative. This alternative consists of the Route 9 treatment plant site with an effluent corridor generally

along Northeast 195th Street and a marine outfall in Puget Sound off Point Wells (Zone 7S) (Figure 1-2).

Since issuance of the EIS, four addenda have been prepared, as described later in this chapter.

1.1.2 Selection of Route 9–195th Street Alternative

On December 1, 2003, King County Executive Ron Sims selected the Route 9–195th Street Alternative for the Brightwater System. In this alternative, the treatment plant is located adjacent to SR-9 north of Woodinville, and the conveyance alignment (the influent and effluent pipes) follows NE 195th Street and then NE/NW 205th Street west from the treatment plant to an outfall off of Point Wells in Puget Sound. Although any of the three action alternatives considered in the EIS could host the Brightwater facilities, Executive Sims determined, after review of the EIS and consideration of information, analysis, and public comment in many areas, that the Brightwater Route 9–195th Street Alternative presented clear advantages compared to the other alternatives.

Advantages of selecting the Route 9 site for the treatment plant included the relative ease to engineer and build the plant on a larger, flatter site and the opportunities for environmental enhancement and mitigation. The 195th Street conveyance pipeline alignment would have fewer construction areas (portals) in residential areas than other alternatives; the influent and effluent tunnels could be combined in a single tunnel along part of the alignment; and larger portions of the pipeline alignment could be located in the public right-of-way, which would result in less disruption to the community than would other alternatives. The Point Wells outfall location would provide an excellent location for mixing of treated effluent with the currents in Puget Sound; this would minimize impacts to eelgrass beds, an important salmon habitat. In addition, there would be space onshore at Point Wells for construction staging areas, and there would be fewer conflicts with fishing and recreation. The selection of the Route 9–195th Street Alternative also would allow overall wastewater system flexibility to respond to changing conditions or additional treatment requirements in the future and to take advantage of water reuse opportunities in the area.

1.1.3 Hearing Examiner's Decision on the Appeal of the EIS

An administrative appeal of the EIS was filed with the King County Hearing Examiner on January 20, 2004. The appeal was filed by the Sno-King Environmental Alliance (SKEA), an organization of persons who own property and/or reside in the vicinity of the proposed Route 9 Brightwater Treatment Plant site and along the proposed pipeline route (Bricklin Newman Dold, 2004). The SKEA appeal alleged that the EIS failed to adequately address new information regarding seismic conditions at the Route 9 site and thus was not adequate under SEPA. The appeal also alleged that the EIS was inadequate because it did not identify and evaluate an adequate number of alternatives to the preferred proposal.

The appeal hearing was conducted in July 2004, and a decision was issued August 3, 2004 (King County, 2004e). The Hearing Examiner found that the EIS was adequate regarding the two sites analyzed for the location of the Brightwater wastewater treatment plant, for the Executive's decision to select the Route 9 site, and for the discussion of potential seismic impacts to the conveyance tunnels and pipelines. New seismic information became available to King County after the EIS was issued raising the possibility of a suspected fault on the Route 9 site (Blakely et al., 2004). Based on this new information, the Hearing Examiner ruled that King County was required to conduct a trenching investigation of a feature called LiDAR Lineament 4 before it could rely on the EIS for future permitting decisions that would determine the location of wastewater treatment facilities on the Brightwater treatment plant site:

> King County should now obtain additional available information as to the location of the fault on the site, and the extent of recent (Holocene epoch) earthquake activity on the suspected fault, if any. If that additional information discloses recent activity of a fault on the Route 9 site, that information would constitute new information on the proposal's probable significant adverse impacts. The discussion of that new information would require issuance of a Supplemental EIS for future government actions. (page 13, conclusion 13, King County, 2004e)[1]

King County conducted studies to obtain the information required by the Hearing Examiner. The studies, described in Chapter 2 of this document, revealed the likely presence of an active fault on the Route 9 site. Based on this new information, King County has evaluated the significant adverse impacts that could result in the unlikely event that a major earthquake were to occur on a fault on the Route 9 site. The results of the evaluation are presented in this Supplemental EIS.

1.2 What New Information Is Provided in this Brightwater Supplemental EIS?

Seismic analyses for the Brightwater Regional Wastewater Treatment System have been performed in stages and include both regional and site-specific studies using several different methodologies. The Final EIS evaluated seismic impacts of the Brightwater proposal based on information that was available at the time. Seismic studies and environmental analysis completed after the EIS was issued and prior to the July 2004 administrative appeal hearing were presented in an addendum to the EIS, Addendum 3 (King County, 2004c). Additional seismic studies were completed in response to the Hearing Examiner's decision. These new studies and their potential implications for the Brightwater Treatment Plant are presented in this Supplemental EIS.

[1] Both parties to this hearing have appealed portions of the Hearing Examiner's decision. A hearing on this appeal is set for April 2005.

In response to the Hearing Examiner's decision, King County entered into a cooperative agreement with the U.S. Geological Survey (USGS) for the purpose of evaluating Lineament 4 as a possible strand of the SWIF. The USGS took the lead on deciding where a trench should be located, and the final trench locations were selected in discussions with members of the King County Design Team. The USGS excavated trenches on and near the Route 9 site in September 2004 in order to determine whether there was geologic evidence indicating the presence of an active earthquake fault on the site related to the SWIF.

One trench was excavated at the northern end of the Route 9 site (Trench 2a), and another trench was excavated on King County property east of the railroad tracks and east of the proposed Brightwater facilities (Trench 2b)(Figure 1-3). Geologic evidence of two, and possibly three, surface-faulting earthquakes was present in Trench 2a; one of the events is estimated to have occurred approximately 16,000 to 12,000 years ago, and a second event is interpreted to have occurred no more than approximately 3,000 years ago. The possible third event might have occurred between 12,000 and 3,000 years ago. Scientists reviewing the data have concluded that the lineament at the north end of the Route 9 site (Lineament 4) is an active fault. The features observed in Trench 2b east of the site appear to be related to tectonic or earthquake activity, but the deposits are older than those exposed in Trench 2a and the deformation could have been caused by glacial ice.

In addition to data from Trenches 2a and 2b, the USGS identified another lineament at the south end of the Route 9 site (Lineament X) based on geophysical data (Appendix A) and surface expressions of drainage channels; however, there is no direct evidence indicating that this lineament is actually a fault. The terrain on the Route 9 site between Lineament 4 on the north and Lineament X on the south appears, based on available geophysical information, to be free of features that would suggest an active fault might be present between Lineaments 4 and X.

After trenching and determining that Lineament 4 is an active fault trace and after finding limited evidence of another lineament at the south end of the site (Lineament X), King County and the Design Team discussed options for further investigations of seismic features on the Brightwater project site. King County decided that, rather than undertaking further studies at this time, they would evaluate the impacts that could result if a worst-case earthquake scenario were to occur on the Route 9 site (see Chapters 4 and 5).

A probabilistic seismic hazard analysis (Appendix B) was conducted to determine the level of earthquake ground motion that could occur at the Route 9 site in the event of a rare regional earthquake, including the potential occurrence of earthquakes on Lineaments 4 and X (Appendix B). The results of this site-specific analysis are being used to design structures of the Brightwater Treatment Plant site to minimize damage if an earthquake were to occur.

More detailed descriptions and discussions of the seismic studies on the Route 9 site are provided in Chapter 2 of this document. Information on the design of Brightwater facilities is provided in Chapter 3.

1.3 What Information on the Brightwater Project Was Provided in Addenda to the EIS?

After issuance of the Brightwater EIS, the planning, analysis, and preliminary design of proposed Brightwater facilities continued and additional information about the proposal and its impacts became available. Under SEPA, an agency may issue an addendum to an EIS in order to provide additional information or analysis that does not substantially change the analysis of significant adverse environmental impacts and alternatives in the existing document (WAC 197-11-600[4][c] and 706). King County has issued four addenda to the Brightwater EIS (King County, 2004 a through d):

- Addendum 1 (January 27, 2004) provided an updated analysis of traffic impacts and mitigation measures, and additional information about potential use of the existing ChevronTexaco Richmond Beach Asphalt Terminal barge dock during construction.
- Addendum 2 (April 2, 2004) provided additional information for selected portal sites and an analysis of impacts of the transportation of excavated materials to and from Portal 19, impacts of a proposed temporary construction access road at the Route 9 site, and impacts of demolition and construction at the Route 9 site.
- Addendum 3 (April 30, 2004) provided additional information on geotechnical and seismic studies related to the evaluation of new data characterizing the Southern Whidbey Island Fault; geotechnical data for design of the conveyance system and outfall; and additional discussion of impacts and mitigation related to seismic and geologic issues.
- Addendum 4 (September 1, 2004) provided additional information on the decision to locate the influent pump station at Portal 41, changes to facilities and their locations along the conveyance corridor, and modifications to the safety relief point. (NOTE: The proposal at the time this addendum was issued included constructing a safety relief point in Kenmore at the mouth of the Sammamish River. Since then, the project description has changed; it no longer includes a safety relief point. Please see the discussion later in this chapter.)

1.4 How Has the Project Description Been Modified Since the EIS Was Issued?

The project description for the Brightwater System has been modified since issuance of the Final EIS. The modifications do not alter the basic configuration of the system. Most were discussed and analyzed in the Final EIS as options or possible mitigation measures. Some were documented in the addenda to the EIS; others have been made since issuance of the addenda. Key modifications are discussed below.

1.4.1 Selection of Portal Sites

The Final EIS analyzed the impacts of construction and operation at alternative candidate portal sites within larger portal siting areas. The portals will be used for construction of the conveyance tunnel. As described in Addendum 2, one candidate portal site was selected for each portal siting area. In all cases, except in Portal Siting Area 44, the selected portal sites are the same or smaller than their corresponding candidate sites described in the Final EIS. The larger site at Portal Siting Area 44 resulted from purchasing constraints; the area and types of impacts would be similar to those described in the Final EIS.

1.4.2 Influent Pump Station at Portal 41

The Final EIS included an analysis of an option to relocate the influent pump station from the proposed location at the Route 9 site to the selected portal location at Portal Siting Area 41. The influent pump station at Portal 41 (Figure 1-2) would contain the same functional components, with some refinements to size and configuration, as described for this option in the Final EIS. Addendum 4 describes impacts and mitigation for these refinements.

1.4.3 Postponement of Portal 11 and Tunnel Between Portals 11 and 44

Construction of Portal 11 and the tunnel between Portals 11 and 44 has been delayed (Figure 1-2). A comprehensive value engineering analysis indicated that there will be adequate capacity until about 2020 to convey and treat flows that are planned to be routed eventually to Brightwater via this section of pipeline. The need for a tunnel or another form of conveyance between these two portals will be re-evaluated in 2010 as flow and population forecasts are updated. This change and changes to locations and types of facilities at other portals are described in Addendum 4.

1.4.4 Possible Construction Access Road to Route 9 Site

Addendum 2 described the impacts and mitigation for a temporary construction access road and a new traffic signal proposed at the SR-9/SR-522 westbound ramp intersection. The access road would be needed only if Brightwater construction were to coincide with the construction of SR-9 improvements by the Washington State Department of Transportation. The road would replace both of the proposed construction access locations described in the Final EIS. It would accommodate all treatment plant construction trips and would be expected to materially reduce the number of construction trips and construction-related traffic along SR-9 north of SR-522. Currently, it is expected that SR-9 improvements will be completed before Brightwater construction begins, and thus the road described in Addendum 2 will not be needed.

1.4.5 Possible Use of the StockPot Building

The Brightwater team has continued to conduct additional analysis and more detailed design of Brightwater facilities. Analysis has shown that the existing StockPot Building could be used by King County for non-process activities such as operations, maintenance, and storage. Trenching on the Route 9 site indicates that an active earthquake fault runs under the northeast portion or in the vicinity of the StockPot Building (Appendix A). Seismic upgrades may be needed to meet Washington State and Snohomish County standards for reuse of the building. A decision on whether or not to use the StockPot Building has not been made. Please see the discussion later in this chapter, Whether to Use the StockPot Building.

1.4.6 No Safety Relief Point

The Brightwater Final EIS and Addendum 4 described the proposal to construct a safety relief point for discharging overflows of stormwater-diluted wastewater into the lower Sammamish River, just above the point where the river flows into the north end of Lake Washington in the Kenmore area. A safety relief point is no longer part of the Brightwater proposal.

It is unlikely that King County would be granted all of the necessary local permits and approvals needed in time to construct a safety relief point. However, it must be emphasized that one of the major reasons for construction of the Brightwater System is to increase system capacity and thereby reduce the probability of system overflows in the Kenmore area. The decision to eliminate the safety relief point does not diminish King County's commitment to protect public health and the environment. The Brightwater System is being designed and will be constructed to high safety and performance standards. Overflows would happen only during extreme combinations of events that would possibly occur no more than once every 100 years. The existing system, combined with Brightwater's additional treatment, conveyance, and storage capacities, will provide the Kenmore area and the north end of Lake Washington with the highest level of overflow protection in the King County system; in other words, once Brightwater is online, this area would have the lowest probability of overflows in the system.

1.4.7 Layout of Treatment Plant Facilities

The layout of the Brightwater facility at the Route 9 site has been modified from that shown in the EIS and Addendum 3 to reflect changes made during preliminary design of the plant. The revised layout is shown in Figure 1-4. Major changes are as follows:

- The arrangement of process and non-process facilities remains the same as presented previously; however, the footprint of the facilities has been compressed to reduce the distance between process facilities and thus reduce construction and long-term operational costs.

- The site design has changed from a forested concept to a landform concept. Rather than locate forest bands between facilities to visually screen the treatment plant from surrounding properties, landscaped landforms will be placed in the foreground along SR-9 to provide visual screening between SR-9 and the treatment plant. Stormwater detention and treatment will be integrated into the foreground in the current concept as was planned with the forested concept. This revised site design will result in less truck traffic during construction because soils excavated onsite will be used to create the landforms, rather than being transported offsite.
- Evaluation during design and development of the membrane bioreactor process indicates that it will be fully functional as planned; thus, there is no longer any need to reserve space for secondary clarifiers.
- The storage building for spare parts and equipment proposed for construction west of the electrical substation at the south end of the site has been removed. Storage would be accommodated either just south of the Plant Operations and Maintenance Building or in the StockPot Building.
- The onsite tunnel portal has been relocated from just south of the Plant Operations and Maintenance Building to the southwestern portion of the site. This location will allow better access for secondary lining of the tunnel, which will reduce the cost of construction.

1.4.8 Treatment of Split-Stream Flow

The design of the treatment plant has progressed over a period of several years, from a conceptual stage to more detailed project-level design. During this time, the technology proposed for treating wastewater has evolved from conventional activated sludge to a combination of membrane bioreactors and ballasted sedimentation to a combination of membrane bioreactors and chemically enhanced primary clarification.

In the Brightwater Draft EIS issued in 2002, King County evaluated the environmental impacts that would result from using a conventional activated sludge process to provide secondary treatment of wastewater prior to discharge. The Final EIS evaluated the environmental impacts that would result from using two different processes together—membrane bioreactors and ballasted sedimentation. In this strategy, average wet-weather flows up to 38 million gallons per day (mgd) would be treated with a secondary treatment process called the membrane bioreactor (MBR) process. Sustained peak flows greater than 38 mgd would be treated with an advanced primary process called ballasted sedimentation. The primary (ballasted sedimentation) and secondary (MBR) flows would be blended and disinfected prior to being discharged into Puget Sound.

The analysis in the Final EIS concluded that the effluent from a split-stream flow that had been treated with MBRs and ballasted sedimentation would produce an effluent that is seven to ten times cleaner than effluent produced from the conventional activated sludgeprocess that is typically used for secondary treatment. In addition, ballasted

sedimentation would remove solids and reduce biochemical oxygen demand at a higher rate than the conventional primary process. This strategy would meet three criteria:

- Produce an effluent quality that is as good as or better than the effluent quality from a conventional activated sludge process.
- Meet state and federal water quality standards.
- Meet anticipated NPDES requirements (including a minimum of 85 percent removal of solids and biochemical oxygen demand).

Since publication of the Final EIS, King County has evaluated options to reduce costs and now is proposing to use chemically enhanced primary clarification rather than ballasted sedimentation for the portion of the flow that bypasses secondary treatment. The performance of chemically enhanced primary clarification is expected to equal or exceed that of ballasted sedimentation at a lower overall cost.

King County is conducting pilot testing of the chemically enhanced primary clarification system at the South Treatment Plant. The goal is to achieve a split-flow volume and effluent quality with MBR/chemically enhanced primary clarification comparable to what would be provided by MBR/ballasted sedimentation.

1.5 How Do Brightwater Siting and Design Reflect Evolving Seismic Information?

In late 1999, King County implemented a three-phase approach to siting the proposed Brightwater Treatment Plant and its associated conveyance pipelines and marine outfall. This approach is described in Chapter 2 of the Final EIS. In Phase 1, King County identified and evaluated potential candidate sites for the treatment plant and outfall zone. In Phase 2, King County developed system alternatives. This Supplemental EIS is part of Phase 3, environmental review, which included preparation of the Draft and Final EIS and addenda.

1.5.1 Purpose of Engineering and Environmental Constraints Analysis

In Phase 1 of the siting process, King County evaluated approximately 95 land areas identified by staff as large enough for a treatment plant based upon 13 informal criteria. Staff developed and implemented an engineering and environmental constraints analysis (E/E Constraints) to help them identify those sites that were potentially suitable for further evaluation and those sites that, based on limited data, were constrained and would pose limitations to construction of a new wastewater treatment plant. One of the constraints considered was whether the potential site was within 0.5 km (approximately 1,500 feet) of a “known fault.”

The E/E Constraints were used to narrow potential sites in the 113-square-mile study area from 95 sites to 38 that were subject to further staff analysis. Using siting criteria that had been formally adopted by the King County Council, the 38 sites ultimately were narrowed to four and then to the two alternative treatment plant sites that were analyzed in the Brightwater EIS (Unocal and Route 9 sites).

The E/E Constraints served as an informal screening tool and were not considered to be a fatal flaw analysis. If an adequate number of sites could be found with no E/E constraints, it was prudent to eliminate the constrained sites from further consideration, since, at that time, the team was dealing with nearly 100 potential alternatives for the treatment plant site. However, if few or no sites were found to be suitable in subsequent evaluations, the project team was open to reconsidering sites that were eliminated earlier using the E/E Constraints analysis.

The E/E Constraints were based on information that was published and readily available in the literature, existing aerial photography, assessor parcel information, and similar resources. The E/E Constraints identified site conditions that, if present on the buildable portion of the site, might affect construction costs or plant operations. By design, the E/E Constraints were based on limited data and were neither intended to serve as, nor did they function as, a rigorous definitive analysis for later detailed environmental analysis of the three action alternatives.

Later, as King County narrowed the number of sites, it used policy criteria approved by the King County Council to guide its site review. To address seismic conditions, these policy criteria focused on liquefaction potential and not on distance from any identified fault.

1.5.2 Use of New Seismic Information in Siting and Design of Brightwater Facilities

At the time the E/E Constraints were developed and applied, there was limited information in the scientific literature on the SWIF. For example, no scientific study had demonstrated conclusively that the SWIF extended onto the mainland or had identified its precise location. The best available information consisted of several approximated projections of SWIF onto the mainland. Subsequent to the time that the E/E Constraints were used, both King County and the USGS have done extensive seismic investigation of the Route 9 site and surrounding areas (see Chapter 2). These investigations have provided King County with far more detailed and precise information about seismic conditions at the Route 9 site. This information has been incorporated into the site design, as described in Chapter 3 of this Supplemental EIS.

In view of this more detailed and precise information, King County and its experts in geology and engineering re-evaluated the risk to the Brightwater facility from three sources of potential damage during an earthquake: ground shaking, soil liquefaction, and ground rupture. Of the three, ground shaking is by far the most prevalent potential source of damage, since ground shaking can occur over a wide area from earthquakes that are

dozens of miles from the site. In contrast, liquefaction requires certain soil conditions at the site. Damage to a structure from surface rupture requires an earthquake to rupture the ground on a particular fault that the structure straddles.

King County evaluated the risk of ground shaking at the Route 9 treatment plant site by conducting probabilistic seismic hazard analyses that consider potential occurrence of earthquakes on Lineaments 4 and X and has mitigated that risk by upgrading the design engineering to account for the stronger ground shaking that could affect the plant site (see Chapter 3 and Appendix B). The resulting "design earthquake" for Brightwater considers ground shaking equivalent to that experienced during recent damaging earthquakes in Northridge, California (magnitude 6.7) and Kobe, Japan (magnitude 6.9). For the Brightwater Route 9 site, this is the magnitude earthquake that has a 2 percent probability of occurring in a 50-year period. King County will account for liquefaction by removing liquefiable soils during construction. With regard to surface rupture, King County will provide a buffer between new Brightwater structures and a known fault (Lineament 4) and the presumed location of a possible fault (Lineament X) on the Route 9 site (see Chapters 2 and 3). King County also has analyzed in this Supplemental EIS the "worst case" impacts that could occur if a future earthquake were to rupture the ground surface along an unknown and hypothetical fault beneath the new structures (see Chapters 4 and 5). King County's approach appropriately responds to the new more detailed seismic information that has been developed since the E/E Constraints were employed nearly 6 years ago.

1.6 What Uncertainties Remain About Buildings on the Route 9 Site?

Although the Brightwater Treatment Plant site plan described in the Final EIS is relatively unchanged, there are uncertainties regarding two buildings: the StockPot Building and the Community-Oriented Building. The current status of the planning associated with these buildings is discussed below.

1.6.1 Whether to Use the StockPot Building

It is uncertain whether the existing StockPot Building would be reused, and, if so, to what extent and for which functions it would be used. The earthquake fault (Lineament 4) at the north end of the Route 9 site appears to extend under the northeast portion of the StockPot Building (Appendix A). A recent review of the building by the Brightwater engineering and architectural team found, nevertheless, that with appropriate structural seismic upgrades the southern half of the building could accommodate non-process functions such as operations, maintenance, and storage. In addition, the northern part of the building could be used for some types of storage.

The StockPot Building was constructed prior to the recent revelation that the northern portion of the building may overlie an active fault (Lineament 4); thus the building could

be severely damaged if the design earthquake or a surface rupture were to occur along Lineament 4. King County has undertaken a study to determine what would need to be done to retrofit the StockPot Building to meet current Washington State and Snohomish County seismic standards for reuse of the building (King County, 2005). At this time, it is uncertain what the extent and, therefore, cost of seismic upgrades may be and whether the cost of upgrades would exceed the cost of constructing new non-process facilities. If the StockPot Building were to be used for operations and maintenance, the Plant Operations and Maintenance Building shown on the site plan near the south end of the site (Figure 1-4) would not be constructed. The decision on whether or not to use the StockPot Building most likely will be determined by the cost of the seismic upgrades that may be needed. King County will continue to evaluate this issue.

The likelihood of a surface rupture under the StockPot Building during the design life of the Brightwater Treatment Plant is extremely low. Nevertheless, this Supplemental EIS takes into account the environmental impacts that could result if the design earthquake were to occur or if the ground were to rupture under the StockPot Building during a major earthquake.

1.6.2 Whether to Build a Community-Oriented Building

King County has been engaged in discussions with community groups and local permitting agencies in an effort to identify what type of mitigation would be desirable and appropriate for the Brightwater System. One of the mitigation measures that has been proposed is the construction of a Community-Oriented Building on the Brightwater site. The building would be available for community and educational uses. A decision about whether to construct such a building could be made as early as mid 2005. If the decision is made to construct the building, it would be included in the final Brightwater System mitigation package.

1.7 What Is the Likelihood That an Earthquake Would Seriously Damage the Brightwater Treatment Plant and Adversely Affect the Environment?

The likelihood that an earthquake would seriously damage the Brightwater Treatment Plant and adversely affect the environment requires that several unlikely events occur at the same time: (1) the ground ruptures beneath one of the structures that contains chemicals or wastewater, (2) the amount of ground displacement associated with rupture is large enough to damage structures, and (3) the damage is sufficient to release liquids that have an adverse impact on the environment. When considered together, the analyses conducted for this Supplemental EIS show that while there is a possibility that a large earthquake could occur that would damage Brightwater treatment facilities seriously enough to cause significant adverse environmental impacts, this would happen only if a series of highly improbable events were to occur simultaneously.

1.7.1 Approach Used to Address the Simultaneous Occurrence of Improbable Events

Several studies have been conducted to determine the location of earthquake faults that may be present on or near the Route 9 site (see Chapter 2). The results of these studies suggest that the potential for ground rupture is extremely low. Nevertheless, a level of uncertainty remains about the precise location of faults, and, if an earthquake were to occur, where and when it would occur and how severe it would be. Other uncertainties include the potential impacts to regional facilities and to treatment plant facilities and operations and the resulting impacts on the environment. These uncertainties are discussed in more detail in Chapter 2.

In the face of uncertainty, King County has developed a worst-case analysis of environmental impacts that could occur if an earthquake on the SWIF were to seriously damage the proposed Brightwater Treatment Plant – consistent with WAC 197-11-080 (see Chapters 4 and 5).This document provides a worst-case analysis of adverse environmental impacts, as allowed by SEPA (see Chapter 5). Implicit to any worst-case analysis is the likelihood that the actual consequences, if the event were to occur, would be less.

1.7.2 Likelihood of Ground Rupture

To begin with, the likelihood is small that a large regional earthquake would occur on the SWIF and affect the Route 9 site (about a 1 percent chance in the 50-year design life of the treatment plant; see Chapter 2). It is even more unlikely that the ground surface would rupture on the Route 9 site during an earthquake. Nevertheless, King County has developed three hypothetical scenarios in order to evaluate what the impacts would be if this were to happen (see Chapter 4). In each of the three hypothetical scenarios, a rupture of the ground surface would occur in a different location on the Route 9 site: on Lineament 4 at the north end of the site, on Lineament X at the south end of the site, or between Lineaments 4 and X on an unknown hypothetical fault.

None of the three hypothetical scenarios is likely to occur. Of the three considered, the least unlikely to occur would be a surface rupture on Lineament 4 because researchers have determined that Lineament 4 is an active fault. A surface rupture on Lineament X is considered to be more unlikely to occur than a surface rupture on Lineament 4 because there is no direct evidence indicating that Lineament X is an active fault. A surface rupture on the Route 9 site between Lineament 4 and Lineament X is considered to be the most unlikely scenario because there is no evidence similar to that for Lineament 4 or Lineament X indicating that any fault exists on the Route 9 site in this area. (See Chapter 2 for a discussion of the SWIF, Lineament 4, and Lineament X.)

Of the three scenarios, the one most unlikely to occur—a rupture between Lineaments 4 and X—would have the worst impacts if, in fact, it did occur. Chapters 4 and 5 describe what would happen under this scenario if a surface rupture were to occur beneath aeration basins, digesters, or chemical storage buildings. The discussion is provided in order to

evaluate worst-case impacts. However, as stated above, it is much more unlikely that a surface rupture would occur directly beneath one of these facilities than along Lineament 4.

1.7.3 Likelihood of Damage to Structures

Brightwater treatment facilities are being designed consistent with building codes and accepted seismic design standards that would minimize damage if an earthquake were to occur on the Route 9 site (see Chapter 3); thus, damage to facilities likely would be less than assumed in the scenarios (see Chapters 4 and 5). For the damage to occur to the levels described in this Supplemental EIS, the rupture would have to occur at the maximum levels of displacement assumed and at the specific locations assumed. The combination of these two conditions occurring represents an extremely unlikely situation.

Studies of damage at other wastewater treatment plants during earthquakes support the conclusion that damage to Brightwater treatment facilities and resulting adverse environmental impacts likely would be less than assumed in this worst-case analysis. Damage to treatment plants during large earthquakes in California, Japan, and Taiwan in the last 25 years has been limited (see Chapter 4), suggesting that the level of damage and environmental impacts assumed in this Supplemental EIS simply would not materialize.

1.7.4 Likelihood of Environmental Impacts

In addition, if one of these scenarios were to occur, the actual level of adverse environmental impacts likely would be less than described in this Supplemental EIS. The worst-case analysis assumes that a series of highly improbable events occur simultaneously. In reality, some of the events may occur, but it is unlikely that all of them would occur at the same time. For example, the analysis of impacts assumes that the maximum possible amount of untreated wastewater would be present at the treatment plant at the moment when a large surface rupture occurred and that this maximum volume would be released to the environment. In reality, if a surface rupture were to occur and damage liquid-holding tanks or basins, it is more likely that smaller volumes of untreated wastewater would be present onsite. The adverse impact analysis also assumes that mitigation measures are not implemented. As discussed in Chapter 5, various mitigation measures exist to limit and in many cases avoid adverse environmental impacts.

1.8 What Environmental Impacts Are Analyzed in this Supplemental EIS?

King County is implementing siting and design mitigation to limit damage to facilities and reduce impacts that could result from damaged facilities if an earthquake on the

SWIF were to cause very strong ground shaking and/or surface rupture on the Route 9 treatment plant site (see Chapter 3).

As discussed above, in order for significant adverse impacts to result from an earthquake at the proposed Brightwater Treatment Plant site, a series of highly improbable conditions would need to take place simultaneously. The most unlikely earthquake scenario evaluated in this Supplemental EIS would involve the following conditions: (1) an earthquake would occur on the SWIF during the 50-year design life of the treatment plant, (2) the earthquake would be strong enough to produce a ground surface rupture (an event that has happened only a few times in 16,000 years), (3) the earthquake would not follow existing fault traces, but rather would create a hypothetical new or undiscovered fault under new treatment plant structures. This worst-case scenario could result in significant adverse impacts that could possibly persist for as long as a few years.

If, under this unlikely scenario, a new fault were to rupture the ground surface under the solids digesters and cause them to crack, the released wastewater solids would move across the Brightwater site and State Route 9 and then could enter Little Bear Creek. The solids could potentially contaminate the water in the creek, robbing it of dissolved oxygen and raising its temperature to a level that might eliminate all existing aquatic biota. These worst-case effects could persist as the contaminants moved downstream into the Sammamish River and Lake Washington. Impacts to fish and other aquatic wildlife would be less than to Little Bear Creek because these larger water bodies would rapidly dilute the pollutants. To mitigate these impacts, King County would clean up the streams and stream banks. However, it is anticipated that it could take several months or years for the health of Little Bear Creek to be fully restored. Such a major release of pollutants would have the potential to pose risks for environmental health. The public would need to avoid direct exposure to contaminated water to avoid the possibility of illness and/or skin irritation.

If a ground-rupturing earthquake were to occur along a new hypothetical fault under one of the chemical storage facilities, some chemicals could be released. However, chemicals that could produce a toxic effect when mixed would be stored in separate facilities. The facilities would be 1,200 feet apart in areas that drain to separated stormwater systems, making it virtually impossible for them to mix.

This Supplemental EIS also evaluates potential major earthquakes on an identified active fault (Lineament 4) and a possible fault (Lineament X). Earthquakes on these lineaments that were large enough to rupture the ground surface would cause much less serious environmental impacts than those described above for a rupture under treatment plant facilities. Neither lineament runs under proposed new treatment process facilities, so no substantial releases of pollutants are anticipated. New treatment plant facilities would be designed to withstand the very strong ground shaking caused by a major earthquake on Lineament 4. Minor pipe cracks and pipe separation could occur, but no pollutants are expected to move offsite. In the unlikely event of a ground-rupturing earthquake on Lineament X, which has not been determined to be a fault, ground offset could severely damage the combined influent and effluent tunnel on the southern end of the treatment plant site. As with an earthquake on Lineament 4, the treatment plant would be designed

to withstand the very strong ground shaking from a major earthquake on Lineament X, and no pollutants would be expected to leave the site.

After any major earthquake where plant damage was suspected, the plant would be shut down for a few days to assess the damage. During that period, Brightwater flows would be routed to the other two regional plants—the West Point and South Treatment Plants. If the Brightwater plant were shut down during dry weather, all flows would receive secondary treatment prior to discharge. However, in very wet weather, the West Point and South plants and the pump stations and pipes leading to them might not have sufficient capacity to handle all of the Brightwater flows along with their own flows. In this case, there would likely be overflows from the conveyance system into Lake Washington, the Sammamish River, and some streams. The possibility exists that all flows that did reach the treatment plants might not necessarily receive full secondary treatment prior to discharge, creating the potential for adverse water quality impacts to freshwaters and Puget Sound. These impacts would be similar to those that would occur if the Brightwater System were not constructed by 2010, as analyzed under the No Action Alternative in the EIS for the Regional Wastewater Services Plan (King County, 1998).

For the least unlikely scenario analyzed in this Supplemental EIS—a strong earthquake on Lineament 4—the Brightwater Treatment Plant would be able to return to full operation after only a few days. In scenarios where the plant had to remain partially or fully shut down for a longer period of time (ground-rupturing earthquakes on Lineament X or the hypothetical new fault), bypasses would be implemented around damaged facilities to allow untreated or partially treated wastewater to be discharged through the Brightwater outfall to Puget Sound. Because of the strong currents in this part of Puget Sound, there would be no significant long-term impacts from this discharge, which could last up to a year.

Under any of the unlikely scenarios discussed in this Supplemental EIS, the possibility exists that a release of wastewater into the groundwater could occur, which could slowly make its way toward Little Bear Creek. The largest quantity of wastewater that would potentially leak into the groundwater would be from a hypothetical new fault forming and rupturing the ground under the aeration basins. If this were to happen, the soils underlying the site would limit the rate at which the water could move, allowing King County time to clean up any contaminated groundwater before it could significantly impair the environment of Little Bear Creek. Also, the treatment plant underdrains would be plugged after the earthquake to keep the contaminated water out of the stormwater drainage system. King County would use proven remediation techniques to remove the contaminated water well before it reached the creek. No impacts to drinking water supplies are expected because wells that supply the Cross Valley Water District are upstream of the Brightwater site.

Any surface releases of wastewater or wastewater gases could cause temporary odor impacts. Depending on the source, King County either would clean up the source of odors or would use portable odor control units to minimize the impact until permanent repairs could be made.

1.9 References

Blakely, R. J., Sherrod, B.L., Wells, R.E., Weaver, C.S., McCormack, D.H., Troost, K.G., and Haugerud, R.A. 2004. *The Cottage Lake aeromagnetic lineament: A possible onshore extension of the Southern Whidbey Island Fault, Washington.* USGS Open-File Report 2004-1204.

Bricklin Newman Dold, LLP. 2004. *Statement of appeal before the King County Hearing Examiner. In re: environmental impact statement for Brightwater sewage treatment facilities.* Seattle, WA.

King County. 1998. *Final environmental impact statement for the Regional Wastewater Services Plan*. Seattle, WA: King County Department of Natural Resources, Wastewater Treatment Division.

King County. 2004a. *Addendum 1 to final environmental impact statement: Brightwater Regional Wastewater Treatment System.* Seattle, WA: Department of Natural Resources and Parks, Wastewater Treatment Division.

King County. 2004b. *Addendum 2 to final environmental impact statement: Brightwater Regional Wastewater Treatment System.* Seattle, WA: Department of Natural Resources and Parks, Wastewater Treatment Division.

King County. 2004c. *Addendum 3 to final environmental impact statement: Brightwater Regional Wastewater Treatment System.* Seattle, WA: Department of Natural Resources and Parks, Wastewater Treatment Division.

King County. 2004d. *Addendum 4 to final environmental impact statement: Brightwater Regional Wastewater Treatment System.* Seattle, WA: Department of Natural Resources and Parks, Wastewater Treatment Division.

King County. 2004e. *Decision denying appeal, subject to conditions. Brightwater final environmental impact statement appeals of adequacy.* Seattle, WA: Office of the Hearing Examiner.

King County. 2005. *Assessment for utilization of StockPot Building.* Prepared for King County Wastewater Treatment Division by CH2M HILL, Brown and Caldwell, Mithun, and Associated Firms. Seattle, WA.

LIST OF FIGURES